

# Review of Interventions to Reduce Stress Among Mothers of Infants in the NICU

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## ABSTRACT

Nearly half a million preterm infants are born each year in the United States. Preterm delivery has significant psychosocial implications for mothers, particularly when their baby spends time in the neonatal intensive care unit (NICU). The decrease in length of gestation causes mothers to have to parent prematurely, without the less time for emotional preparation than mothers of full-term infants. Parents of NICU infants experience stress related to feelings of helplessness, exclusion and alienation, and lack sufficient knowledge regarding parenting and interacting with their infants in the NICU. There are a number of interventions that nurses can do that help reduce the stress of mothers of infants in the NICU.

**Key Words:** maternal stress, NICU, postpartum support

According to the Centers for Disease Control and Prevention,<sup>1</sup> 12.3% of infants are born prematurely (prior to 37 weeks' gestation) each year in the United States. This equates to nearly half a million preterm infants born each year. Prematurity is associated with increased risk of life-long morbidity such as pulmonary, cardiac, and renal problems as well as increased risk of mortality.<sup>2,3</sup> Preterm infants often require admission to a NICU for specialized care. Although preterm and low-birth-weight infants account for approximately 12% of births in the United States, the cost for these infants' care is nearly half of the total hospital charges for cost of term infant care, with the average length of stay of

25 days estimated at \$30,527 for moderately preterm infants at 32 weeks' gestation.<sup>4</sup> The duration and intensity of a preterm infant's stay in the neonatal intensive care unit (NICU) can be even greater, depending on gestational and morbidity factors, thereby further impacting the cost and burden of care.

Preterm delivery birth has psychosocial implications as it has been associated with "premature parenting" wherein a woman's expectations of a "normal" pregnancy and birth with a healthy infant are not realized.<sup>5</sup> The full-term duration of pregnancy allows time for emotional adaptation to the dynamic changes that are unfolding during pregnancy and to parenting. Premature birth and subsequent NICU admission are not only a situational adaptation for the parents but also an experience associated with stress.<sup>5</sup> Miles and colleagues<sup>6,7</sup> studied stress of parents with children in ICU settings and identified 3 sources of stress: personal/family, situational, and environmental. Specifically for parents with infants in the NICU, aspects of the physical environment such as monitors, lights, and tubes attached to the baby contribute to the stressful experience.<sup>8</sup> Other researchers found that the loss of the maternal role was the greatest source of stress for mothers.<sup>9,10</sup> In a systematic review of the needs of parents of a NICU infant, needs identified included communication of information, parental involvement in infant care, protecting the infant, individualized care, and positive perception by and interaction with the

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NICU staff.<sup>9</sup> Similarly, in a synthesis of qualitative studies on parents' ethical decision making regarding their NICU infant, themes that emerged included communication of information, parental involvement in decision making, providers' expression of hope and compassion, and trust in the provider team.<sup>11</sup> These aspects of parental care are critical as parents of NICU infants experience stress related to feelings of helplessness, exclusion, and alienation, and lack sufficient knowledge regarding parenting and interacting with their infants in the NICU.<sup>12,13</sup> Preterm delivery has been identified as a risk factor for stress, postpartum posttraumatic stress disorder (PTSD), postpartum depression, difficulty with initial bonding and attachment, and production of breast milk.<sup>9,14-16</sup> Research has noted that in women who give birth prematurely, at least 1 symptom of PTSD is reported, and a large majority (86.6%) experience increased arousal, avoidance, and reexperiencing.<sup>14,17</sup> Based on previous work with mothers of infants in the NICU, a modified perinatal PTSD questionnaire tool was developed for use in this population to identify maternal distress and refer for additional health services, as indicated.<sup>18</sup> Other symptoms such as frequent nightmares, distressing thoughts about the NICU experience, avoidance, and overprotectiveness have been associated with women who have experienced preterm delivery. Women with PTSD have increased stress, anxiety, and depression,<sup>19</sup> which may negatively influence maternal-infant bonding.<sup>20</sup> However, a review of 18 studies of early mother-preterm infant relationships found that some interactions of preterm dyads were improved compared with term dyads, although the researchers noted that these relationships are complex and that maternal-infant separation should be mitigated.<sup>21</sup>

Intervention approaches and tools for mothers of infants in the NICU have been developed. A review of interventions had been published in 1998, presenting the evidence for the various approaches to reduce stress experienced by parents of preterm infants in the NICU.<sup>22</sup> Since the publication of the review, additional interventions have been implemented in the NICU setting. The purpose of this article was to review the recent primary source literature, from 1998 to the present, regarding the effectiveness of interventions aimed at decreasing NICU-related maternal stress.

## METHODOLOGY

The search strategy used to identify interventions that were conducted to decrease the level of stress for mothers of preterm infants admitted into a NICU included an in-depth search of the National Guideline Clearinghouse, PubMed, CINAHL, and EBSCOhost. Key words used for the search included the following

terms: NICU, preterm, infant, mother, parent, stress, intervention. The search was limited to completed experimental intervention studies aimed at reducing stress of mothers of preterm infants in the NICU that were published in English from 1998 to the present. The initial search of the 4 databases yielded 46 hits, after removing duplicate citations between the databases. These 46 hits were examined to include only relevant intervention research studies that met the inclusion criteria and examined maternal stress as an outcome measure, reducing the number of identified studies to 18 articles. Two articles were excluded as they were the longitudinal follow-up of their original research studies without additional intervention. The technique of snowballing was used to locate an additional article that met the search criteria, for a total of 17 research intervention studies.

## RESULTS

The 17 research studies used various designs and methods. There were 12 randomized controlled trials,<sup>10,13,23-32</sup> 3 quasiexperimental studies,<sup>33-35</sup> 1 repeated-measures design study,<sup>36</sup> and 1 pilot feasibility study using pretest-posttest design<sup>37</sup> (see the Supplemental Digital Content Table, <http://links.lww.com/ANC/A1>). Many of the identified research studies support the effectiveness of an intervention aimed at decreasing the level of maternal stress associated with having a preterm infant admitted to the NICU, although differences in designs, populations, and outcomes were observed between the studies.

### Randomized Controlled Trials

Among the 12 randomized controlled trials, various intervention approaches, assessment tools, and outcome measures were used involving parents or significant others of preterm infants.

Browne and Talmi<sup>24</sup> compared the knowledge, behaviors, and stress levels of 3 groups of sociodemographically high-risk mothers of preterm infants born at 36 or fewer weeks' gestation who were admitted to a university hospital NICU in Oklahoma. The 84 mothers were assigned to 1 of 3 study groups. To teach them about their infants, one group of participants ( $n = 28$ ) was taught tailored information about infant reflexes, attention, motor skills, and sleep-wake states using the Assessment of Preterm Infant Behavior and the Mother's Assessment of the Behavior of her Infant, based on the Brazelton Neonatal Behavioral Assessment Scale to observe and to elicit infant responses. The second group of participants ( $n = 31$ ) was given a book and watched educational slides and tapes with general information on preterm infants, and the third group ( $n = 25$ ) served as the controls and participated in an informal, general discussion about preterm infant care. Findings of the study showed that compared with the control group, both intervention groups had significantly improved

knowledge scores ( $P < .0001$ ) and behavioral scores ( $P < .05$ ) as well as nearly significant lower Parenting Stress Index (PSI) scores ( $P = .056$ ). The researchers pointed out that 28% of all participating mothers, independent of group assignment, had PSI scores above the published high normative range.

Glazebrook et al<sup>25</sup> conducted a cluster randomized controlled trial among 6 NICUs in 2 regions of England, comparing 95 maternal-infant dyads in the intervention group and 109 dyads in the control group, with infants born at less than 32 weeks' gestation. The study's aim was to evaluate the effectiveness of the Parent Baby Interaction Programme on Neurobehavioral Assessment of the Preterm Infant (NAPI) scores indicating neurobehavioral development, maternal PSI-SF (short form) scores, Nursing Child Assessment Teaching Scale assessing the quality of parent-infant interaction, and the Home Observation for Measurement of the Environment (HOME) assessing the infant's home as a developmentally promotional environment. There were no significant differences between the intervention and control groups' PSI scores, infant NAPI neurobehavioral development scores, and Nursing Child Assessment Teaching Scale parent-interaction scores. The researchers explained that the low dose of the intervention might have resulted in the lack of significant differences between the control and intervention groups.

Kaarsen et al<sup>26</sup> evaluated the Mother-Infant Transaction Program (MITP), which included both pre-discharge and post-discharge intervention sessions among parents of infants in a university hospital in Norway. The researchers compared the intervention group of parents of 71 preterm infants with the control group of parents of 69 preterm infants. Both groups of preterm infants had a mean gestational age of 30 weeks, and another control group of parents of 72 term infants had a mean gestational age of 39 weeks. The researchers found that among parents of preterm infants, the intervention group had lower PSI scores than the control group in all of the domains at 6 and 12 months (significance range, 0.005-0.01) except for the maternal child domain score at 12 months. Furthermore, the intervention group had comparatively similar stress-level scores to those of the parents of term infants.

In a recent study by Matricardi et al,<sup>32</sup> mothers and fathers of 42 preterm infants in a NICU in Italy were taught how to observe their infants and to massage their infants in an effort to enhance the parental engagement in infant care. The researchers used the Parental Stress Scale: Neonatal Intensive Care Unit (PSS: NICU) to assess the differences between the intervention group and the standard support control group. Compared with the control group, the intervention group had significantly lower stress levels related to NICU sights and sounds ( $P < .05$ ), infants'

appearance and behavior ( $P < .001$ ), and parental role alteration ( $P < .001$ ). In examining the differences between the parents' genders, the researchers found that mothers had higher stress levels related to parental role alteration than fathers ( $P = .05$ ). Intervention group mothers, but not fathers, experienced a significant reduction in the stress of role alteration at discharge ( $P < .05$ ).

Meijssen et al<sup>29</sup> examined the effect of the Infant Behavioral Assessment and Intervention Program on mother-infant interaction as well as on maternal stress among mothers of preterm infants less than 32 weeks' gestation who were hospitalized in 1 of the 7 participating hospitals in Amsterdam. The post-discharge intervention included 6 to 8 home visits by a trained pediatric physical therapist who provided a developmental progress report and tailored suggestions for supporting infant self-regulation. The PSI was used to evaluate maternal stress, and the Dutch Nijmeegse Ouderlijke Stress Index in its shorter and longer versions was used to evaluate various aspects of maternal stress, role perception, and infant adaptability at 12 and 24 months' corrected age. There were no significant differences in PSI stress scores between the intervention and control groups. Intervention group mothers assessed their infants as happier ( $P = .03$ ) and less hyperactive or distractible ( $P = .02$ ) than the control group mothers, although they also reported higher rates of feeling social isolation ( $P = .03$ ).

Studies by Melnyk et al<sup>13,23</sup> randomly assigned participants to the control group or the intervention group, which received the Creating Opportunities for Parent Empowerment (COPE) model. The COPE model is an educational and behavioral intervention that includes education about the common behavior, characteristics, and development of preterm infants, developmentally appropriate information, information about infant states and cues, targeted parent-infant strategies for interaction and involvement in care including preparation for transition to being discharged to home, and parental activities for practicing the education. The pilot study of the 4-phase intervention and follow-up conducted in a NICU at a university hospital in New York used various assessment and evaluation tools through 6 months' corrected age. The primary outcome examined infant cognitive development and maternal emotional and functional coping using various tools. The 20 women who received the COPE intervention reported significantly less stress, as measured by the PSS: NICU, related to the sights and sounds of the NICU compared to the 22 women in the control group. Infants in the intervention group scored significantly higher on the cognitive assessment tools at 3 and 6 months.<sup>23</sup>

Using the COPE intervention model, Melnyk et al<sup>13</sup> conducted an expanded randomized controlled trial in 2 NICUs in New York to examine the efficacy of the program at improving parent-infant

interactions and parent mental health, improving infant developmental and behavioral outcomes, and decreasing infant length of stay. There were 138 mothers, fathers, or grandmothers randomly assigned to the COPE intervention group and 109 mothers and fathers in the control group. Evaluation of the COPE intervention indicated significantly lower levels of maternal stress at 2 to 4 days postintervention (PSS: NICU) ( $P = .03$ ), depression at 2 months (Beck Depression Inventory [BDI-II]) ( $P = .02$ ), and anxiety at 2 months (State Trait Anxiety Inventory) ( $P = .03$ ), as well as facilitating stronger parental confidence ( $P = .002$ ) and knowledge ( $P < .001$ ). The average length of stay in the NICU was 3.8 days, which was shorter for infants in the COPE intervention group than those in the control group ( $P = .05$ ).

Newnham et al<sup>28</sup> evaluated the MITP among 63 mothers of preterm infants in Australia, using maternal and infant measures at 3 and 5 months' corrected age. There were 31 dyads in the control group and 32 dyads in the MITP intervention group. There were no significant differences in Edinburgh Postnatal Depression Scale depression scores between the groups. Parenting Stress Index child domain scores were improved in the intervention group ( $P < 0.01$ ). Compared with control group mothers, intervention group mothers were more responsive to their infants ( $P < .05$ ), intervention group infants were more attentive than control infants ( $P < .01$ ), and intervention group dyads showed improved mutual interaction at 3 and 6 months ( $P < .01$ ).

Ravn et al<sup>30</sup> evaluated the MITP program in Norway among mothers of preterm infants born at 30 to 36 weeks' gestation, following them for the first year of life. The researchers found that compared with the control group at 1 month, intervention group mothers had lower depression scores ( $P = .04$ ) and fewer somatic symptoms ( $P = .05$ ) on the Center for Epidemiological Studies Depression scale. There was no significant difference in PSI stress scores between groups and, unexpectedly, intervention mothers reported less infant smile and activity than control group mothers. The researchers offer that the possible reason for the lack of significance in stress levels may relate to a perception of low stress associated with parenting and interacting with moderately and late-preterm infants.

Silverstein et al<sup>31</sup> conducted a randomized controlled pilot study to assess the feasibility of delivering an intervention aimed at teaching problem-solving education (PSE) to low-income mothers of preterm infants born at 33 or fewer weeks of gestation. The mothers were either English or Spanish speakers and their infants were admitted to 1 of 2 urban level III NICU units in Boston, Massachusetts. The aim of the intervention was to assess the

depression symptoms using the Quick Inventory of Depressive Symptoms scale, stress using the Perceived Stress Scale, and maternal functioning using the Social Adjustment Scale and the modified PTSD scale. The study included 25 mothers in the control group and 24 mothers in the intervention group. The intervention was delivered by PSE trained graduate students in 4 one-on-one sessions during hospitalization and then weekly or biweekly postdischarge at home or in the hospital. The researchers found that delivery of the PSE intervention was feasible among high-risk mothers. Although there were no significant differences in stress between the groups, there was a trend toward improved social adjustment among the intervention group mothers.

Turan et al<sup>10</sup> conducted a randomized controlled trial to examine the effect of stress-reducing nursing interventions on the stress levels of mothers and fathers of preterm infants in a NICU in Turkey. The intervention consisted of a 30-minute educational program about their infants and the NICU environment conducted within the first week of admission. The intervention group parents also received an introduction to the unit and personnel and were provided answers to their questions. The parents in the control group received nothing beyond the routine unit procedures. The mothers' and fathers' PSS: NICU scores were measured after their infants' 10th day in the NICU. The stress levels among mothers in the intervention group were significantly lower than those of the control group ( $P < .05$ ), although the group difference between the fathers' scores was not statistically significant.

Van der Pal et al<sup>27</sup> used 2 consecutive randomized controlled trials to compare standard care versus basic developmental care and basic developmental care versus the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) with behavioral observations at 2 NICUs in the Netherlands. The basic developmental care intervention consisted of the reduction of light and sound through the use of incubator covers, supported motor development and physiological stability through the use of nests and positioning aids, and explanation of developmental care to the parents. The intervention in the second trial consisted of NIDCAP infant behavior observations of infants before, during, and after care given every 7 to 10 days by a member of the NIDCAP-trained developmental specialty team consisting of a psychologist and 5 nurses who worked with the parents in individually guiding them in caring for their infants. The researchers found no significant differences in confidence, perceived nursing support, or parental stress. As a possible explanation, they offered that increased involvement of fathers through the NIDCAP intervention might have contributed to the similarity in scores between both fathers and mothers.

### Other Intervention Research Designs

Three quasiexperimental studies compared maternal-infant outcomes associated with the delivery of an intervention to decrease stress in those involved in caring for families with infants in the NICU. Cooper et al<sup>35</sup> used a quasiexperimental, posttest-only design with a retrospective survey to evaluate the impact of the March of Dimes NICU Family Support (NFS) program at 8 different sites in the United States. The study compared the sites where the NFS intervention was fully, partially, or not instituted. The researchers used telephone interviews and surveys to gather data from 11 NICU administrators, 502 staff, and 216 families. NICU administrators identified benefits of NFS, including culture change and additional support to families. Surveys of NICU staff showed that NFS enhanced the overall quality of NICU care and surveys of the families showed reduced stress and feelings of greater parenting confidence because of the NFS intervention.

In another quasiexperimental design, Jotzo and Poets<sup>34</sup> used a sequential control group design for mothers of preterm infants during hospitalization in a level III NICU at a university hospital in Germany. The purpose of the study was to determine whether a trauma-preventive psychological intervention reduced the severity of symptomatic responses to the traumatic impact of preterm delivery of 25 mothers in the intervention group compared with trauma symptoms in 25 mothers in the control group. The intervention was conducted by the department psychologist who provided a one-time crisis intervention within 5 days postpartum, with added psychological aid throughout the NICU stay. The intervention included general trauma preventive components and specific preterm delivery components. The researchers found that at discharge, intervention group mothers showed significantly lower levels of symptomatic response to the traumatic stressor of preterm delivery than those in the control group ( $P < .01$ ).

Preyde and Ardal<sup>33</sup> conducted a quasi-experimental cohort study to evaluate the effectiveness of parent-to-parent peer support for mothers of very preterm infants born at less than 30 weeks' gestation and admitted to a NICU in Toronto, Ontario, Canada. The researchers paired 32 mothers in the intervention group with mothers who had previously delivered a very preterm infant and who were trained in providing peer support, primarily over the telephone. The 28 mothers in the control group did not get the peer support intervention. At 4 weeks, mothers in the intervention group scored significantly lower stress levels on the PSS: NICU ( $P < .001$ ). Likewise, in comparison with the control group at 16 weeks, the intervention group scored significantly lower levels of anxiety (State Trait Anxiety Inventory) ( $P < .05$ ) and depression (BDI), ( $P < .01$ ) and reported greater perceived social

support using the Multidimensional Scale of Perceived Social Support scale ( $P < .01$ ).

Morey and Gregory<sup>36</sup> used a repeated-measures design to evaluate the effect of a nurse-led intervention on maternal stress related to the experience of having a preterm baby in the NICU in a high-risk antenatal unit at a university medical center located in the Northeast United States. Admission reasons included incidence of premature labor, premature rupture of membranes, and/or maternal or fetal health concerns that were likely to result in preterm labor and delivery. Forty-two women participated in the study and were surveyed prior to the intervention, immediately postintervention, and at 48 to 72 hours after the infant's NICU admission. The intervention had employed several teaching strategies including an educational video developed by the hospital NICU team, a detailed description of the clinical aspects of prematurity, the care requirements of premature infants, the family involvement in the NICU, and a tour of the NICU. Maternal stress (PSS: NICU) associated with the sights and sounds of the NICU significantly decreased over time ( $P = .01$ ). Likewise, maternal stress associated with infant behavior and appearance significantly decreased over time ( $P = .05$ ). Maternal feelings about role attainment were not significantly changed.

Feeley et al<sup>37</sup> piloted a single-group, pretest-posttest design to assess the feasibility and acceptability of an intervention program with mothers of very low-birth-weight infants (<1500 g) in a NICU at a university teaching hospital in Montreal, Quebec, Canada. As their intervention, the researchers developed the Promoting Mothers' Ability to Communicate (PMAC) program. The PMAC program uses anxiety-reduction techniques and cognitive-behavioral approaches to reduce maternal anxiety with behavior-oriented sensitivity and interaction education and training adapted from the COPE program<sup>23</sup> and another behavior-oriented program from the University of Washington. The PMAC program consisted of 6 one-hour teaching sessions that were delivered by trained interventionists at 4 weeks postpartum and continued postdischarge, with the first 5 sessions taking place during hospitalization and the sixth session at home. The researchers felt that the PMAC program was both feasible and acceptable to mothers of infants admitted into the NICU, as 62% of mothers agreed to participate although 39% of them withdrew. The effectiveness of the PMAC program was not assessed during this pilot study.

### DISCUSSION

Overall, the intervention studies demonstrated various levels of effectiveness on the identified primary outcome variable of reducing maternal stress levels,

at least on some measures of the stress assessment,<sup>10,13,23,24,26,28,32-36</sup> with a few research studies not finding significant improvements in maternal stress levels,<sup>25,27,29-31</sup> and 2 studies found the intervention to be feasible and acceptable.<sup>31,37</sup> Differences in the outcomes may be due to the intervention methods and designs, participants, and outcome evaluation process. In addition, some studies found a positive impact on aspects of parenting an infant in the NICU other than maternal stress.

Various types, timing, and intensities of interventions were tested, with some of the interventions being group oriented and others being delivered in a one-on-one manner. One study used a repeated-measures design that may have enabled continued exposure to the intervention, thereby reinforcing the study aims.<sup>36</sup> The randomized controlled trials had varying success and the 3 quasiexperimental studies showed a significant decrease in maternal stress or trauma levels, depending on the outcome variables that were defined for the specific study. The intensity of the interventions ranged from lower intensity such as a 30-minute educational program in the first week of NICU admission<sup>10</sup> to increased intensity such as a 4-phase educational-behavioral program first delivered at 8 days of admission and followed through 6 months.<sup>13,23</sup> The timing and location included prenatal or early postpartum in the hospital and postdischarge at home, although not all of the studies indicated the exact timing of the intervention delivery.

Two of the reviewed studies had conducted follow-up studies of their original participants and found long-term positive outcomes for the participants in the intervention groups.<sup>26,33</sup> Following the 2-year longitudinal follow-up, researchers found no significant difference in the cognitive or motor outcomes between the control and intervention group infants. Compared with the control group, mothers in the intervention group had lower levels of stress in the child domain ( $P = .001$ ) and in the parent domain ( $P = .02$ ) whereas fathers had lower levels of stress in the child domain ( $P = .02$ ).<sup>38</sup> Similarly, in a 4-month follow-up of the original study participants who received educational and social support, researchers found that women in the intervention group reported greater confidence in parenting ( $P < 0.05$ ), better quality of listening support ( $P < 0.05$ ), and greater understanding of their infants' medical conditions ( $P < 0.05$ ) than those in the control group.<sup>33</sup> These findings suggest that there are improved outcomes with longer-duration and higher-intensity programs, which may require a greater investment.

Sample sizes of the reviewed intervention studies varied according to type of participants and study design. Although most studies evaluated the impact of the intervention on mothers of preterm infants,<sup>23-25,28-31,33,34,37</sup> 5 sampled both parents as well

as 1 grandmother,<sup>10,13,26-27,32</sup> 1 sampled high-risk pregnant women,<sup>36</sup> and 1 had a broader inclusion of families, NICU administrators, and staff.<sup>35</sup> Some researchers found that fathers and mothers differed in their stress levels and interactions with their infants,<sup>10,13,27,32</sup> although one study found no significant differences in the stress scores between the mothers and fathers.<sup>26</sup> It was noted that in the study where there were no significant differences between the genders, the mothers participated in every intervention session while the fathers' median participation was only 50%, indicating a difference in the intensity of the intervention exposure that may have influenced the outcomes.<sup>26</sup> A recently published descriptive study comparing maternal and paternal stress levels associated with parenting a preterm infant in the NICU found significant differences between the genders and recommended tailored care to each of the parents as their needs may differ.<sup>39</sup> Another sample variation was the infants' gestational ages, which ranged from 24 to less than 37 weeks with some studies specifying weight as well, contributing to clinical differences in the samples that may potentially influence severity of health and development issues that may further impact parental stress.

Outcome measures differed among the intervention studies. The most frequently used tools to measure maternal stress were the PSI and the PSS: NICU. Other outcomes were included such as maternal and/or parental knowledge, parent-infant interaction, posttraumatic stress, depression, and anxiety, as well as infant length of stay in the NICU. Using different measurement tools challenges the comparison of effectiveness of interventions as the outcomes measures and the assessment of factors contributing to the outcomes differ. However, while maternal stress may not have been significantly reduced in a specific study, other benefits may have been achieved and were documented if measurement tools for other defined outcomes were used. For example, a study in Italy found that while maternal stress levels measured with the PSI tool were not significantly different between the intervention and control groups, the mothers in the intervention group perceived their infants as happier and less distractible, but they also perceived themselves as more socially isolated.<sup>29</sup> Similarly, an intervention conducted in Norway found that PSI scores were not significantly improved for the mothers in the intervention group, although those mothers had lower depression scores, fewer somatic symptoms, and higher breastfeeding rates than the mothers in the control group.<sup>30</sup>

The current review is limited to articles that described intervention studies and were published in the English language. In addition, the reviewers selected the primary outcome variable of interest to be the reduction of maternal stress levels, while many of the studies included other outcomes

measures. Of note is that there are no studies included from developing countries as the literature search only identified studies emanating from developed countries, although minority and immigrant populations are included in many of the reviewed articles. This dearth of information about programs aimed at reducing stress among mothers of infants in the NICU in developing countries points to the need for evaluations of programs in those countries.

The issue of parental stress in the NICU is a global issue as reflected by the international representation of the studies reviewed having been conducted in 9 different countries (Supplemental Digital Content Table). As various interventions were identified as effective, it becomes important to replicate the successful interventions in different cultures and geographic locations. In addition to the educational, informational, and social needs of the mothers of infants in the NICU, cultural needs should be considered. The intervention conducted by Preyde and Ardal<sup>33</sup> used the buddy system, connecting mothers of preterm infants with other mothers who had experienced previous preterm parenting and were of similar ethnicity and culture to the index mother, which the researchers considered important as Toronto has an ethnically diverse population.<sup>40</sup> Culturally sensitive care of families with an infant in the NICU may contribute to the effectiveness of such care. Another group of researchers at the same institution in Canada, where the culturally appropriate care program has been implemented since 1996, recommends the strategies that they have used with families of culturally diverse backgrounds. These strategies relevant to parents of preterm infants include using cultural interpreters to translate both the language and the cultural values for the clients, parent buddy program in the NICU, collaboration with community nurses who refer to culturally and linguistically appropriate lay visitors, health providers, and services, and culturally and language appropriate educational resources for women and their families.<sup>41</sup> The authors of a clinical practice guideline recommend providing spiritual support and honoring requests for truth telling as part of cultural consideration and accommodation.<sup>42</sup> Other evidence-based recommendations in the guideline are sanctioning of a shared decision-making model, early and repeated care conferencing to reduce family stress, improving consistency in communication, honoring culturally appropriate requests, educating staff, permitting open flexible visitation, and offering family support.<sup>42</sup>

## CONCLUSION

The evidence presented in this review identifies the use of interventions aimed at decreasing the level of maternal stress associated with having an infant in the NICU. Evaluation of the effective interventions

should be conducted in other locations among diverse populations to examine the reproducibility of interventions. Addressing NICU mothers' emotional and knowledge needs in a culturally sensitive manner through evidence-based interventions will facilitate improved wellness and interaction outcomes of maternal-infant dyads.

## References

- Centers for Disease Control and Prevention. Prematurity. <http://www.cdc.gov/features/prematurebirth/>. Published 2009. Accessed November 13, 2012.
- Abitbol CL, Rodriguez MM. The long-term renal and cardiovascular consequences of prematurity. *Nat Rev Nephrol*. 2012;28:265-274.
- Narang I. What goes around comes around: childhood influences on later lung health? Long-term follow-up of infants with lung disease of prematurity. *Chron Respir Dis*. 2010;7:259-269.
- Kirkby S, Greenspan JS, Kornhauser M, Schneiderman R. Clinical outcomes and cost of the moderately preterm infant. *Adv Neonatal Care*. 2007;7:80-87.
- Lubbe W, Bornman J. Early intervention care programme for parents of neonates. *Curationis*. 2005;28:73-82.
- Miles MS, Brunssen SH. Psychometric properties of the parental stressor scale: infant hospitalization. *Adv Neonatal Care*. 2003;3:189-196.
- Carter MC, Miles MS. The Parental Stressor Scale: pediatric intensive care unit. *Matern Child Nurs J*. 1989;18:187-198.
- Miles MS, Funk SG, Carlson J. Parental Stressor Scale: neonatal intensive care unit. *Nurs Res*. 1993;42:148-152.
- Cleveland LM. Parenting in the neonatal intensive care unit. *J Obstet Gynecol Neonatal Nurs*. 2008;37:666-691.
- Turan T, Basbakkal Z, Özbek S. Effect of nursing interventions on stressors of parents of premature infants in neonatal intensive care unit. *J Clin Nurs*. 2008;17:2856-2866.
- Rosenthal SA, Nolan MT. A meta-ethnography and theory of parental ethical decision making in the neonatal intensive care unit. *J Obstet Gynecol Neonatal Nurs*. 2013;42:492-502.
- Wigert H, Johansson R, Berg M, Hellstrom AL. Mothers' experience of having their newborn child in a neonatal intensive care unit. *Scand J Caring Sci*. 2006;20:35-41.
- Melnyk BM, Feinstein N, Alpert-Gillis L, et al. Reducing premature infants' length of stay and improving parents' mental health outcomes with the Creating Opportunities for Parent Empowerment (COPE) neonatal intensive care unit program: a randomized, controlled trial. *Pediatrics*. 2006;118:e1414-e1427.
- Holditch-Davis D, Bartlett TR, Blickman AL, Miles MS. Posttraumatic stress symptoms in mothers of premature infants. *J Obstet Gynecol Neonatal Nurs*. 2003;32:161-171.
- Beck C. Post-traumatic stress disorder due to childbirth. *Nurs Res*. 2004;53:216-224.
- Forcada-Guex M, Pierrehumbert B, Borghini A, Moessinger A, Muller-Nix C. Early dyadic patterns of mother-infant interactions and outcomes of prematurity at 18 months. *Pediatrics*. 2006;118:e107-e114.
- Melnyk BM, Crean HF, Feinstein NF, Fairbanks E. Maternal anxiety and depression after a premature infant's discharge from the neonatal intensive care unit: explanatory effects of the creating opportunities from the parent empowerment program. *Nurs Res*. 2008;7:383-394.
- Hynan MT, Mounts KO, Vanderbilt DL. Screening parents of high-risk for emotional distress: rationale and recommendations. *J Perinatol*. 2013;33:748-753.
- Onoye J, Goebert D, Morland L, Matsu C, Wright T. PTSD and postpartum mental health in a sample of Caucasian, Asian, and Pacific Islander women. *Arch Womens Ment Health*. 2009;12:393-400.
- Paulson JF, Dauber S, Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics*. 2006;118:659-668.
- Korja R, Latva R, Lehtonen L. The effects of preterm birth on mother-infant interaction and attachment during the infant's first two years. *Acta Obstet Gynecol Scand*. 2012;91:164-173.
- Griffin T, Wishba C, Kavanaugh K. Nursing interventions to reduce stress in parents of hospitalized preterm infants. *J Pediatr Nurs*. 1998;13:290-295.
- Melnyk BM, Alpert-Gillis L, Feinstein N, et al. Improving cognitive development of low-birth-weight premature infants with the COPE program: a pilot study of the benefit of early NICU intervention with mothers. *Res Nurs Health*. 2001;24:373-389.
- Browne J, Talmi A. Family-based intervention to enhance infant-parent relationships in the neonatal intensive care unit. *J Pediatr Psychol*. 2005;30:667-677.

25. Glazebrook C, Marlow N, Israel C, et al. A randomized trial of a parenting intervention during neonatal intensive care. *Arch Dis Child Fetal Neonatal Ed.* 2007;92:F438-F444.
26. Kaarensen PI, Ronning JA, Ulvund SE, Dahl LB. A randomized, controlled trial of the effectiveness of an early-intervention program in reducing parenting stress after preterm birth. *Pediatrics.* 2006;118:e9-e19.
27. Van der Pal SM, Maguire CM, le Cessie S, Wit JM, Walther FJ, Bruil J. Parental experiences during the first period at the neonatal unit after two developmental care interventions. *Acta Paediatr.* 2007;96:1611-1616.
28. Newnham C, Milgrom J, Skouteris H. Effectiveness of a modified mother-infant transaction program on outcomes for preterm infants from 3 to 24 months of age. *Infant Behav Dev.* 2009;32:17-26.
29. Meijssen DE, Wolf MJ, Koldeewijn K, van Wassenaeer AG, Kok JH, van Baar AL. Parenting stress in mothers after very preterm birth and the effect of the Infant Behavioral Assessment and Intervention Program. *Child Care Health Dev.* 2010;37(2):195-202.
30. Ravn IH, Smith L, Smeby NA, et al. Effects of early mother-infant intervention on outcomes in mothers and moderately and late preterm infants at age 1 year: a randomized controlled trial. *Infant Behav Dev.* 2012;35:36-47.
31. Silverstein M, Feinberg E, Cabral H, et al. Problem-solving education to prevent depression among low-income mothers of preterm infants: a randomized controlled pilot trial. *Arch Womens Ment Health.* 2011;14:317-324.
32. Matricardi S, Agostino R, Fedeli C, Montirosso R. Mothers are not fathers: differences between parents in the reduction of stress levels after a parental intervention in a NICU. *Acta Paediatr.* 2012;102:8-14.
33. Preyde M, Ardal F. Effectiveness of a parent "buddy" program for mothers of very preterm infants in a neonatal intensive care unit. *CMAJ.* 2003;168:969-973.
34. Jotzo M, Poets C. Helping parents cope with the trauma of premature birth: an evaluation of a trauma-preventive psychological intervention. *Pediatrics.* 2005;115:915-919.
35. Cooper L, Gooding J, Gallagher J, Sternesky L, Ledsky R, Berns S. (2007). Impact of a family-centered care initiative on NICU care, staff and families. *J Perinatol.* 2007;27:S32-S37.
36. Morey JA, Gregory K. Nurse-led education mitigates maternal stress and enhances knowledge in the NICU. *MCN Am J Matern Child Nurs.* 2012;37:182-191.
37. Feeley N, Zelkowitz P, Charbonneau L, et al. Assessing the feasibility and acceptability of an intervention to reduce anxiety and enhance sensitivity among mothers of very low birth-weight infants. *Adv Neonatal Care.* 2008;8:276-284.
38. Kaarensen PI, Ronning JA, Tunby J, Nordov SM, Ulvund SE, Dahl LB. A randomized controlled trial of an early intervention program in low birth weight children: outcomes at 2 years. *Early Hum Dev.* 2008;84:201-209.
39. Tandberg BS, Sandtro HP, Vardal M, Ronnestad A. Parents of preterm evaluation of stress and nursing support. *J Neonatal Nurs.* 2013;19:317-326. <http://www.sciencedirect.com/science/article/pii/S1355184113000094>. Accessed March 10, 2013.
40. Preyde M. Mothers of very preterm infants: perspectives on their situation and a culturally sensitive intervention. *Soc Work Health Care.* 2007;44:65-83.
41. Bracht M, Kandankery A, Nodwell S, Stade B. Cultural differences and parental responses to the preterm infant at risk: strategies for supporting families. *Neonatal Netw.* 2002;21:31-38.
42. Davidson J, Powers K, Hedayat K, et al. Clinical practice guidelines for support of the family in the patient-centered intensive care unit: American College of Critical Care Medicine Task Force 2004-2005. *Crit Care Med.* 2007;35:605-622.